CTX 2400

VHF/FM Marine Radiotelephone

- Full 25 Watt transmit power
- 10 programmable VHF/FM marine channels
- Fast select feature for channel 16 with indicator
- Low power transmit switch for in-harbor use
- Front mounted speaker
- Detachable microphone preventing unwanted users

Specifications

General:

Frequency range:	
Transmitter:	156.00 – 157.50 MHz
Receiver:	156.00 – 163.00 MHz
Number of channels:	
Transmitter:	20
Receiver:	24
Supply voltage:	13.6 volts DC negative ground
Antenna impedance:	50 ohms
Modulation:	16F3
Microphone impedance:	600 – 2000 ohms
Current drain:	
Transmitter H/L:	5.0A/2.0A
Receiver stby/rated:	0.4A/1.0A
Temperature range:	–20°C to +50°C
FCC:	Part 83 & 15
DOC:	RSS182
Dimensions:	7-1/2"W x 3"H x 9-13/16"D (190 x 76 x 250 mm)
Weight:	Approx. 7.7 lbs. (3.5 kg)

Transmitter:

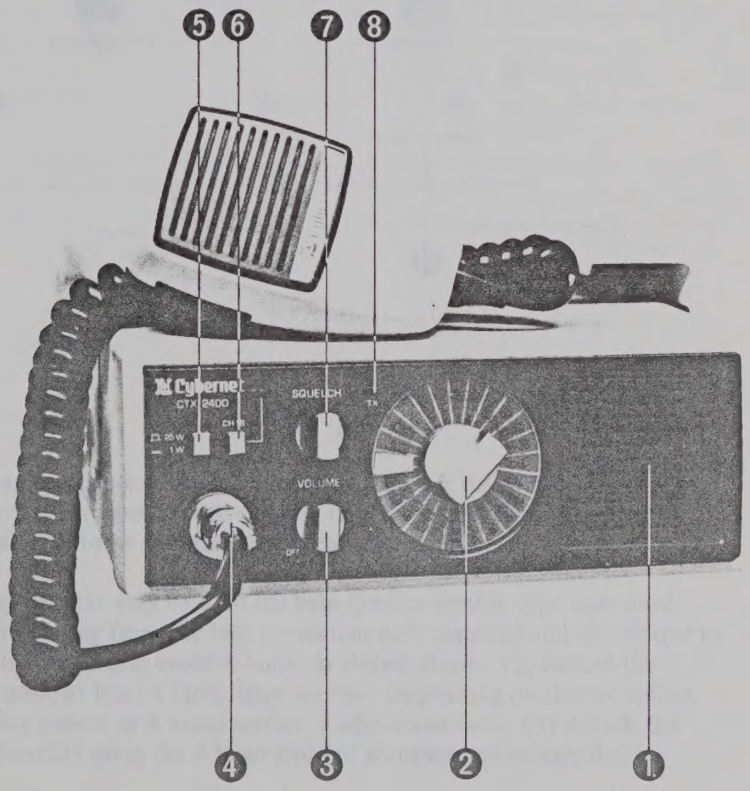
Output power:	25W/1W
Deviation:	±5 kHz max. @ 1 kHz
Spurious & harmonics:	–70 dB
Audio frequency response:	+1, –3 dB, 300 – 3000 Hz
Distortion:	5%

Receiver:

Sensitivity:	
–12 dB sinad:	0.3 μV
20 dB quieting:	0.35 μV
Squelch sensitivity:	
Threshold:	10 dB noise quieting
Tight:	2 μV
Modulation acceptance bandwidth:	±7 kHz
Spurious & image rejection:	–70 dB
Intermodulation rejection:	–70 dB
Selectivity:	–70 dB
Hum & noise:	–50 dB
Audio frequency response:	+1, –8 dB, 300 – 3000 Hz
Audio output 10% THD 4 ohms:	5 watts

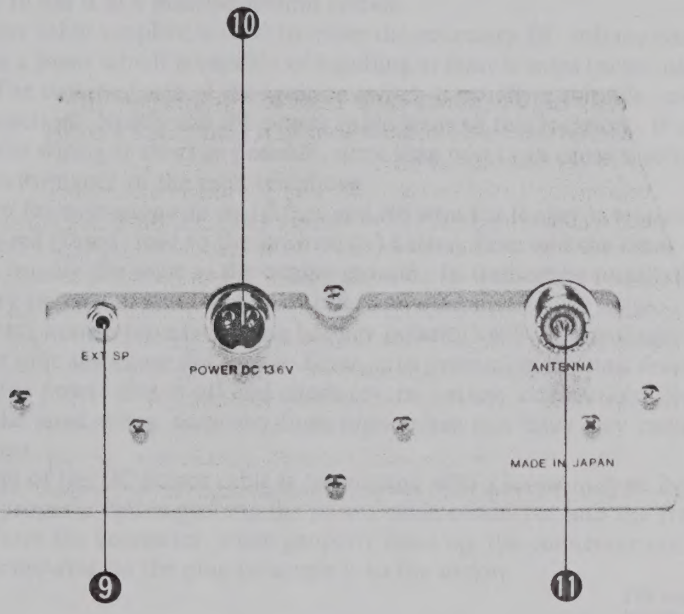
Operating Controls

❶ **Speaker.** Built-in front mounted speaker.
❷ **Channel Selector.** Used to select any of 24 channels. The radiotelephone does not transmit on weather broadcast channels – WX1, WX2, WX3 and WX C. Channels 12, 14, 24, 25, 27, 69, 71, 72, 81A and 83A may be changed to new channels as desired. Refer to the section 'Installing New Channels'.
❸ **Off/Volume Control.** This turns the power on and controls the sound output from the built-in speaker. To switch the unit off, rotate the control fully counterclockwise.
❹ **Microphone Connector.** This connector is used for connection of the microphone which is supplied with this radiotelephone.
❺ **25W/1W Selector.** Pushbutton selects either 25W or 1W transmit power. With the pushbutton released, the radiotelephone produces full 25W transmitting power for longer communication range. The depressed position produces 1W for short range communications.
❻ **Channel 16 (Distress) Priority Pushbutton.** This pushbutton, when depressed, switches the unit to channel 16 (Distress Calling channel) regardless of the existing setting of the Channel selector.
❼ **Variable Squelch Control.** This quiets the receiver section when signals are not being received thus allowing the quiet stand by operation.
Starting at the fully counterclockwise position (minimum squelch), rotate the control clockwise until the receiver is just quieted when no signal is being received.
Incoming signals will automatically release the squelch and be heard. Careful adjustment is necessary since setting the squelch too far clockwise will not allow weaker signals to overcome the squelch action.
❽ **Transmit Lamp.** Illuminates when transmitting.



Rear Panel Connectors

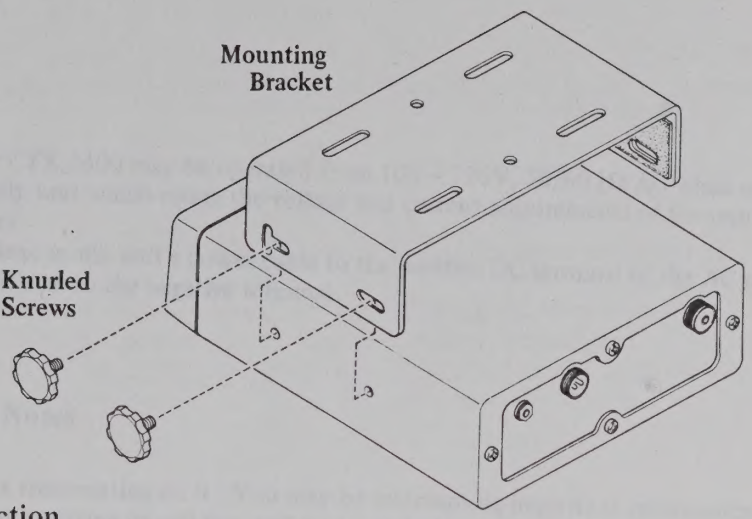
❾ External Speaker Jack. This jack is designed for use of an external speaker (or horn). Insertion of a speaker plug (standard 1/8" 'Phone' plug) into this jack will automatically silences the built-in speaker.
Note. A protective rubber seal cap is installed over this jack. Do not remove it unless you are using the jack.
❿ Power 13.6V DC Connector. DC power to operate the radiotelephone is fed through this connector using the DC power cables supplied. The connector has a locating key and allows the power plug inserted in only one way. Align key onto the connector. Do not force it.
Note. The DC power cable supplied is incorporated with an inline protective fuse on the positive line.
⓫ Antenna Connector. The SO-239 type antenna connector to accept PL-259 type antenna plug. The cable from the antenna should be terminated with this type of 50 Ohm connector.



Installation

Location. Before installing the radiotelephone, choose a location which is protected. Make sure the location chosen is one in which it is convenient to operate the radiotelephone. Also bear in mind the microphone bracket will have to be mounted in the same general area.

Mounting Bracket. The mounting bracket may be used for base type or gimble type over-head mounting. (1) Remove the paper backing from the two protective pads supplied and attach one to each side of the transceiver over the mounting bracket holes, as shown above. (2) Secure the bracket to the mounting surface using at least 4 fairly large screws. Depending on the mounting location, you can use 4 self-tapping screws or 4 wood screws, washers and nuts. (3) Attach the radiotelephone to the mounting bracket using the 4 large knurled securing screws supplied.



Power Connection

Important. This unit is designed for operation from 12-Volt negative ground electrical system. Do not attempt to use it in a positive ground system.

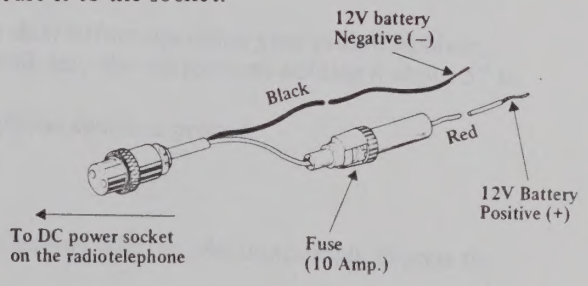
The DC power cable supplied is used to make the necessary DC voltage connections to boat's battery line. Choose a point which is capable of handling at least 6 amps (never use a lighting circuit, for example). The switched side of the ignition switch is usually a suitable point for the **positive (+)** 12 volt connection. Neatly run the power cable leads to this location. If you must extend the power leads, keep the wiring as short as possible, since long wires can cause a voltage drop which will affect the performance of the radiotelephone.

Use #10 wire for extensions up to 10 feet and #8 wire for longer extensions.

Connect the **red** (fused) lead to the positive (+) battery line, and the black wire to the hull ground **(battery –)**, usually the same as the engine ground. In transceiver installations, the ground system is very important and has a great effect on communication range.

Reverse battery connections (reversing battery polarity) will automatically actuate the protection circuit in the unit and cause the fuse to blow, thus protecting the unit from damage. If the fuse blows, turn the power switch off and check reverse battery connection. Replace the fuse with one having the same rating, since any fuses higher than this value may cause damage to the radiotelephone.

The other end of the DC power cable is terminated with a screw-in type 2-pin plug. Always line up the keyway properly before pushing the power cable connector into the transceiver socket. Do not attempt to force the connector, when properly lined up, the connector can be inserted easily. Rotate the screw-ring on the plug to secure it to the socket.



Antenna Connection

Use a VHF marine antenna which meets the 50 ohm termination requirements. It should be mounted as high as possible for maximum range. Connect it to the antenna connector on the rear panel of the radiotelephone, using 50 ohm coaxial cable with a **PL-259** connector.

Since there are a large number of VHF marine antennas available, you should consult the dealer from whom you purchased the unit for further information on marine antennas that meet your specific needs.

AC Operation

Power Connection. The CTX-2400 may be operated from 105 – 120V, 50/60 Hz AC when used with any AC power supply unit which meets the voltage and current requirements of the unit (13.6V DC, 6A or higher).
Simply connect the **red** lead in the unit's power cable to the **positive** DC terminal of the AC power supply unit and the black wire to the **negative** terminal.

Important Operating Notes

Listen to a channel before transmitting on it. You may be interrupting important communication.
Always identify your boat by giving its call sign and name at the beginning and end of each message.
Keep a log book of all distress, emergency, navigation, and safety type of information. Note the date, time, call letters and names of all ships involved and the content of the message. The log book should be signed by the person making entries.
It is against the law to use profane or obscene language on the radio. Remember, you're transmitting on a party line.

Operation

To Receive
Before attempting to operate the radiotelephone, make sure that the antenna is connected to the unit properly.
(1) Turn power on by rotating the Volume Control clockwise.
(2) Rotate the Squelch Control fully counterclockwise.
(3) Make sure that the Channel 16 Priority pushbutton is released.
(4) Select the desired channel by rotating the Channel Selector.
(5) Adjust the Squelch control slowly clockwise until the noise just disappears.
(6) While listening to signals that are coming in, adjust the Volume control to a proper loudness.

To Transmit
Monitor the channel to be sure that the channel is clear before operating your radiotelephone.
(1) Depress the microphone transmit switch and talk into the microphone holding it about 5" to your mouth.
The red Transmit lamp will go on when the microphone switch is pressed.
(2) To receive, release the transmit switch.

Channel 16 Priority Pushbutton
To directly select the channel 16 regardless of the Channel selector selection, simply depress the Channel 16 Priority pushbutton.

COMPREHENSIVE VHF-FM MARINE RADIOTELEPHONE CHANNELS . . . by Designator

OPERATING CHANNEL DESIGNATIONS		FREQUENCY (MHz)		TYPE OF TRAFFIC	FUNCTION	
ORIGINAL	ADDITIONAL	SHIP TX	COAST TX		SHIP/SHIP	SHIP/SHORE
1		156.05	160.65	International Only	–	Yes
2		156.1	160.7	International Only	–	Yes
3		156.15	160.75	International Only	–	Yes
4		156.2	160.8	International Only	–	Yes
5		156.25	160.85	International Only	–	Yes
6		156.3	–	SAFETY	Yes	No
7		156.35	160.95	International Only	–	Yes
7A		156.35	156.35	Commercial	Yes	Yes
8		156.4	–	Commercial	Yes	No
9		156.45	156.45	Commercial	Yes	Yes
9		156.45	156.45	Non-Commercial	Yes	Yes
10		156.5	156.5	Commercial	Yes	Yes
11		156.55	156.55	Commercial	Yes	Yes
12		156.6	156.6	Port Operations, USCG	Yes	Yes
13		156.65	156.65	Locks, Canals, Pilots	Yes	Yes
14		156.7	156.7	Port Operations, USCG	Yes	Yes
15		156.75	156.75	Environ., Hydrographic	Ship Receive Only	Ship Receive Only
16		156.8	156.8	DISTRESS CALLING	Yes	DISTRESS CALL
17		156.85	156.85	State Control Restricted	No	Yes
18		156.9	161.5	International Only	Yes	Yes
18A		156.9	156.9	Commercial	Yes	Yes
19		156.95	161.55	International Only	Yes	Yes
19A		156.95	156.95	Commercial	Yes	Yes
20		157.0	161.6	Port Operations	No	Yes
21		157.05	161.65	International Only	–	Yes
21CG		157.05	157.05	USCG Restricted	Yes	Yes
22		157.1	161.7	International Only	–	Yes
22CG		157.1	157.1	USCG Restricted	Yes	Yes
23		157.15	161.75	International Only	–	Yes
23CG		157.15	157.15	USCG Restricted	Yes	Yes
24		157.2	161.8	Public Corresp.	No	Yes
25		157.25	161.85	Public Corresp.	No	Yes
26		157.3	161.9	Public Corresp.	No	Yes
27		157.35	161.95	Public Corresp.	No	Yes
28		157.4	162.0	Public Corresp.	No	Yes
	60	156.025	160.625	International Only	Ship Receive Only	Ship Receive Only
	61	156.075	160.675	International Only	,,	,,
	62	156.125	160.725	International Only	,,	,,
	63	156.175	160.775	International Only	,,	,,
	64	156.225	160.825	International Only	,,	,,
	65	156.275	160.875	International Only	Yes	Yes
	65A	156.275	156.275	Port Operations	Yes	Yes
	66	156.325	160.925	International Only	Yes	Yes
	66A	156.325	156.325	Port Operations	Yes	Yes
	67	156.375	–	Commercial	Yes	No
	68	156.425	156.425	Non-Commercial	Yes	Yes
	69	156.475	156.475	Non-Commercial	Yes	Yes
	70	156.525	–	Non-Commercial	Yes	No
	71	156.575	156.575	Non-Commercial	Yes	Yes
	72	156.625	–	Non-Commercial	Yes	No
	73	156.675	156.675	Port Operations	Yes	Yes
	74	156.725	156.725	Port Operations	Yes	Yes
	75	GUARD CHANNEL		–	–	–
	76	GUARD CHANNEL		–	–	–
	77	156.875	–	Commercial	Yes	No
	78	156.925	161.525	International Only	Yes	Yes
	78A	156.925	156.925	Non-Commercial Only	No	Yes
	79	156.975	161.575	International Only	Yes	Yes
	79A	156.975	156.975	Commercial	Yes	Yes
	80	157.025	161.625	International Only	Yes	Yes
	80A	157.025	157.025	Commercial	–	Yes
	81	157.075	161.675	International Only	–	Yes
	82	157.125	161.725	International Only	–	Yes
	83	157.175	161.775	International Only	–	Yes
	83CG	157.175	157.175	USCG Aux. Only	Yes	Yes
	84	157.225	161.825	Public Corresp.	No	Yes
	85	157.275	161.875	Public Corresp.	No	Yes
	86	157.325	161.925	Public Corresp.	No	Yes
	87	157.375	161.975	Public Corresp.	No	Yes
	88	157.425	162.025	International Only	Yes	Yes
	88A	157.425	–	Commercial	Yes	No
WE_1		–	162.55	NOAA Weather	Ship Receive Only	Ship Receive Only
	WE_2	–	162.4	NOAA Weather	,,	,,
WE_3		–	162.475	,,	,,	,,
	WE_4	–	161.650	,,	,,	,,

Check locally for Channels Authorized or used in your Area.

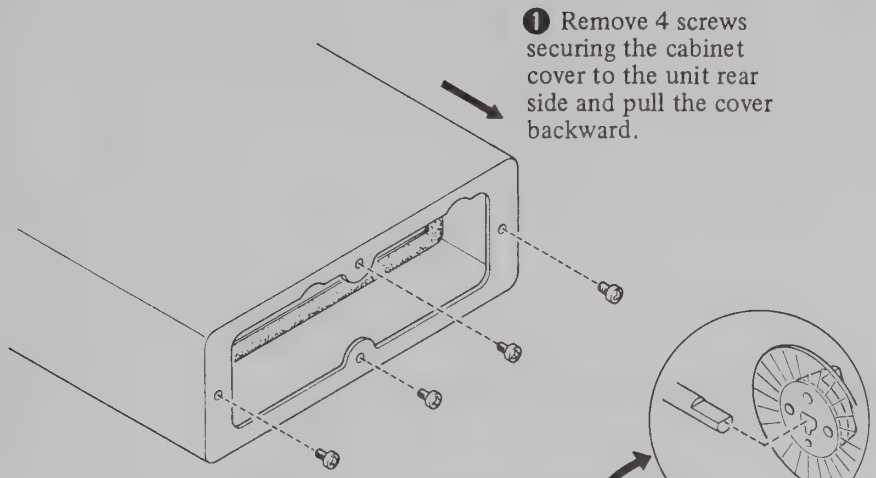
USA VHF-FM MARINE RADIOTELEPHONE CHANNELS . . . by Function

OPERATING CHANNEL DESIGNATORS		FREQUENCY (MHz)		POINTS OF COMMUNICATION	TYPE OF TRAFFIC
ORIGINAL	ADDITIONAL	SHIP TX	COST TX		
DISTRESS, SAFETY AND CALLING					
16		156.8	156.8	Ship/Ship, Ship/Shore	DISTRESS CALLING
INTERSHIP SAFETY					
6		156.3	156.3	Ship/Ship	SAFETY
NAVIGATIONAL BRIDGE TO BRIDGE					
13		156.65	156.65	Ship/Ship, Ship/Shore	Locks, Canals, Pilots, Bridges
ENVIRONMENTAL					
15		–	156.75	Shore to Ship, Rev Only	Environ., Hydrographic
STATE CONTROL					
17		156.85	156.85	Ship/Shore	RESTRICTED
PORT OPERATIONS					
12		156.6	156.6	Ship/Ship, Ship/Shore	USCG
14		156.7	156.7	"	USCG, Port Auth.
20		157.0	161.6	Ship/Shore Only	Port Operations, USA
	65A	156.275	156.275	Ship/Ship, Ship/Shore	"
	66A	156.326	156.325	"	"
	73	156.675	156.675	"	"
	74	156.725	156.725	"	"
COMMERCIAL					
7A		156.35	156.35	Ship/Ship, Ship/Shore	Commercial, USA
8		156.4	-	Ship/Ship Only	"
9		156.45	156.45	Ship/Ship, Ship/Shore	"
10		156.5	156.5	"	"
11		156.55	156.55	"	"
18A		156.9	156.9	"	"
19A		156.95	156.95	"	"
	67	156.375	–	Ship/Ship Only	Work boats
	77	156.875	-	"	Commercial, USA
	79A	156.975	156.975	Ship/Ship, Ship/Shore	"
	80A	157.025	157.025	"	"
	88A	157.425	–	Ship/Ship Only	Fishing Vessels
NON-COMMERCIAL					
9		156.45	156.45	Ship/Ship, Ship/Shore	Clubs, Marinas, Yards, etc.
	68	156.425	156.425	Ship/Ship, Ship/Shore	Yachts
	69	156.475	156.475	Ship/Ship, Ship/Shore	Clubs, Marinas, Yards, etc.
	70	156.525	-	Ship/Ship Only	Yachts
	71	156.575	156.575	Ship/Ship, Ship/Shore	Clubs, Marinas, Yards, etc.
	72	156.625	–	Ship/Ship Only	Yachts
	78A	156.925	156.925	Ship/Shore Only	Clubs, Marinas, Yards, etc.
	83CG	157.175	157.175	Ship/Ship„Ship/Shore	USCG Aux. Only
PUBLIC CORRESPONDENCE					
24		157.2	161.8	Ship/Public Coast	Telephone Corresp.
25		157.25	161.85	"	"
26		157.3	161.9	"	"
27		157.35	161.95	"	"
28		157.4	162.0	"	"
	84	157.225	161.825	"	"
	85	157.275	161.875	"	"
	86	157.325	161.925	"	"
	87	157.375	161.975	"	"
NOAA WEATHER SERVICE					
WE_1		–	162.55	Ship Receive Only	Weather Broadcasts
	WE_2	–	162.4	"	"
WE_3		–	162.475	Ship Receive Only	Weather Broadcasts
	WE_4	–	162.650	"	"

Check locally for Channels Authorized or used in your Area.

Installing New Channels

The CTX-2400 is normally supplied with 24 channels for immediate operation on 20 U.S. channels and weather monitoring of 4 weather broadcasts.
The channels 12, 14, 24, 25, 27, 69, 71, 72, 81A and 83A may be changed to any other VHF FM marine channels if desired by re-programming the screw-in type matrix board arrangement inside the unit.
Important. The Federal Communications Commission requires that any adjustment of the frequency of a radiotelephone should be performed by a technician holding a first or second class radiotelephone license or equivalent.


❶ Remove 4 screws securing the cabinet cover to the unit rear side and pull the cover backward.
❷ Replace the channel selector dial with the one supplied separately. The channel selector dial can fit onto the channel selector shaft in only one way to prevent improper positioning. Align key way as shown properly.

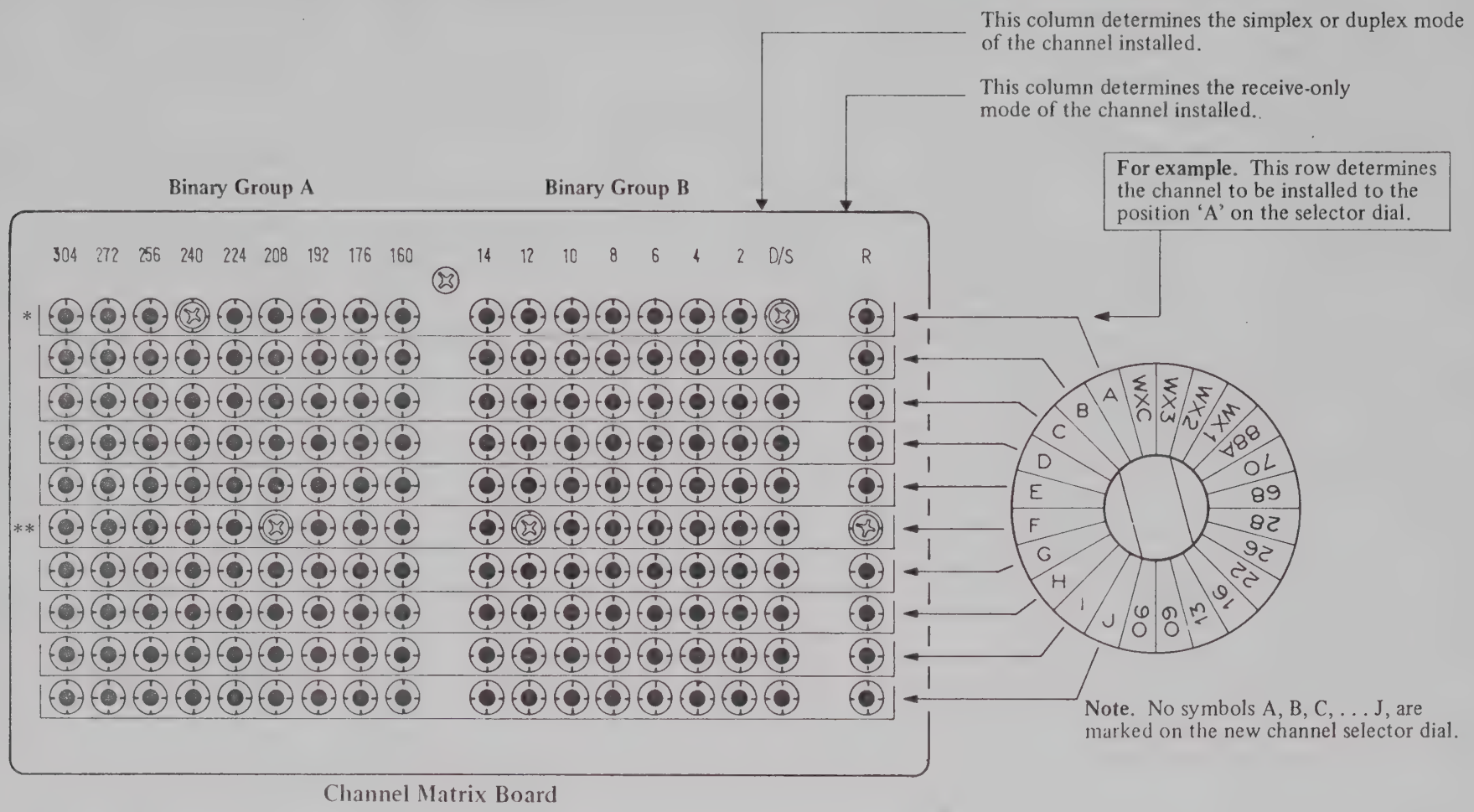
Example (*)

To install the channel 20 to the position 'A' on the new channel selector dial, for example, perform the following:
(1) Refer to the matrix programming chart in this manual, channel 20.
(2) In the chart, the channel 20 has the screws in columns '240' and 'D'. Secure two screws supplied with the unit into these holes in the 'A' row which corresponds to the position 'A' on the channel selector dial.
(3) Now the channel 20 has been installed to the position 'A' on the channel selector. Affix decal '20' (supplied) onto the channel selector dial position 'A'.

Example (**)

To install the channel 15 to the position 'F' on the new channel selector dial for example, perform the following:
(1) Refer to the matrix programming chart in this manual, channel 15.
(2) In the chart, the channel 15 has the screws in columns '12', '208' and 'R'. Secure three screws supplied with the unit into these holes in the 'F' row which corresponds to the position 'F' on the channel selector dial.
(3) Now the channel 15 has been installed to the position 'F' on the channel selector.
(Since transmitting on the channel 15 is prohibited, the unit will not transmit on the channel.)
Affix decal '15' (supplied) onto the channel selector position 'F'.

* Example showing channel 20 installed to position 'A'.
** Example showing channel 15 installed to position 'F'.


This column determines the simplex or duplex mode of the channel installed.
This column determines the receive-only mode of the channel installed.
For example. This row determines the channel to be installed to the position 'A' on the selector dial.
Binary Group A
Binary Group B
304 272 256 240 224 208 192 176 160
14 12 10 8 6 4 2 D/S R
*
**
A B C D E F G H I J
WXC WX3 WX2 WX1 88A 70 68 28 26 22 16 15 09 06
Note. No symbols A, B, C, . . . J, are marked on the new channel selector dial.
Channel Matrix Board

Matrix PC Board Programming Chart

Channel	Frequency (MHz)		N Code	Programming Chart ○ = Screw																	
				Corresponding Column Position on Matrix Board*																	
	TX	RX		2	4	6	8	10	12	14	160	176	192	208	224	240	256	272	304	'D'	'R'
01	156.050	160.650	164		○						○									○	
02	156.100	160.700	168				○				○									○	
03	156.150	160.750	172						○		○									○	
04	156.200	160.800	176									○								○	
05	156.250	160.850	180		○							○								○	
06	156.300	156.300	184				○					○									
07	156.350	160.950	188						○			○								○	
07A	156.350	156.350	188						○			○									
08	156.400	156.400	192										○								
09	156.450	156.450	196		○								○								
10	156.500	156.500	200				○						○								
11	156.550	156.550	204						○				○								
12	156.600	156.600	208											○							
13	156.650	156.650	212		○									○							
14	156.700	156.700	216				○							○							
15	156.750	156.750	220						○					○							○
16	156.800	156.800	224												○						
17	156.850	156.850	228		○										○						
18	156.900	161.500	232				○								○					○	
18A	156.900	156.900	232				○								○						
19	156.950	161.550	236						○						○					○	
19A	156.950	156.950	236						○						○						
20	157.000	161.600	240													○				○	
21	157.050	161.650	244		○											○				○	
21CG	157.050	157.050	244		○											○					
22	157.100	161.700	248				○									○				○	
22CG	157.100	157.100	248				○									○					

hannel	Frequency (MHz)		N Code	Programming Chart ○ = Screw																		
				Corresponding Column Position on Matrix Board*																		
	TX	RX		2	4	6	8	10	12	14	160	176	192	208	224	240	256	272	304	'D'	'R'
23	157.150	161.750	252						○							○				○	
23CG	157.150	157.150	252						○							○					
24	157.200	161.800	256														○			○	
25	157.250	161.850	260		○												○			○	
26	157.300	161.900	264				○										○			○	
27	157.350	161.950	268						○								○			○	
28	157.400	162.000	272															○		○	
60	156.025	160.625	162	○							○									○	○
61	156.075	160.675	166			○					○									○	○
62	156.125	160.725	170					○			○									○	○
63	156.175	160.775	174							○	○									○	○
64	156.225	160.825	178	○								○								○	○
65	156.275	160.875	182			○						○								○	
65A	156.275	156.275	182			○						○									
66	156.325	160.925	186					○				○								○	
66A	156.325	156.325	186					○				○									
67	156.375	156.375	190							○		○									
68	156.425	156.425	194	○									○								
69	156.475	156.475	198			○							○								
70	156.525	156.525	202					○					○								
71	156.575	156.575	206							○			○								
72	156.625	156.625	210	○										○							
73	156.675	156.675	214			○								○							
74	156.725	156.725	218					○						○							
77	156.875	156.875	230			○									○						
78	156.925	161.525	234					○							○					○	
78A	156.925	156.925	234					○							○						
79	156.975	161.575	238							○					○					○	
79A	156.975	156.975	238							○					○						
80	157.025	161.625	242	○												○				○	
80A	157.025	157.025	242	○												○					
81	157.075	161.675	246			○										○				○	
81A	157.075	157.075	246			○										○					
82	157.125	161.725	250					○								○				○	
83	157.175	161.775	254							○						○				○	
83CG	157.175	157.175	254							○						○					
84	157.225	161.825	258	○													○			○	
85	157.275	161.875	262			○											○			○	
86	157.325	161.925	266					○									○			○	
87	157.375	161.975	270							○							○			○	
88	157.425	162.025	274	○														○		○	
88A	157.425	157.425	274	○														○			
WX1	–	162.550	316						○										○	○	○
WX2	–	162.400	304																○	○	○
WX3	–	162.475	310			○													○	○	○
WXC	–	161.650	244		○											○				○	○

* Listed in contrary order to the actual matrix board arrangement.

Channel	Frequency (MHz)		N Code	Programming Chart ○ = Screw																	
				Corresponding Column Position on Matrix Board*																	
	TX	RX		2	4	6	8	10	12	14	160	176	192	208	224	240	256	272	304	'D'	'R'
23	157.150	161.750	252						○							○				○	
23CG	157.150	157.150	252						○							○					
24	157.200	161.800	256														○			○	
25	157.250	161.850	260		○												○			○	
26	157.300	161.900	264				○										○			○	
27	157.350	161.950	268						○								○			○	
28	157.400	162.000	272															○		○	
60	156.025	160.625	162	○							○									○	○
61	156.075	160.675	166			○					○									○	○
62	156.125	160.725	170					○			○									○	○
63	156.175	160.775	174							○	○									○	○
64	156.225	160.825	178	○								○								○	○
65	156.275	160.875	182			○						○								○	
65A	156.275	156.275	182			○						○									
66	156.325	160.925	186					○				○								○	
66A	156.325	156.325	186					○				○									
67	156.375	156.375	190							○		○									
68	156.425	156.425	194	○									○								
69	156.475	156.475	198			○							○								
70	156.525	156.525	202					○					○								
71	156.575	156.575	206							○			○								
72	156.625	156.625	210	○										○							
73	156.675	156.675	214			○								○							
74	156.725	156.725	218					○						○							
77	156.875	156.875	230			○									○						
78	156.925	161.525	234					○							○					○	
78A	156.925	156.925	234					○							○						
79	156.975	161.575	238							○					○					○	
79A	156.975	156.975	238							○					○						

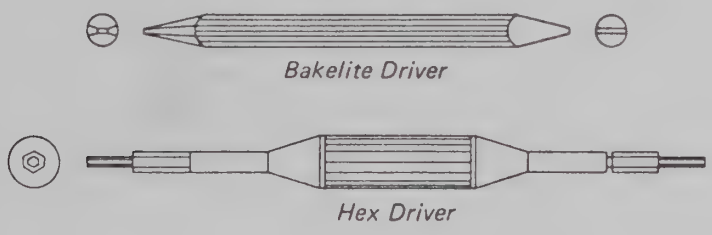
Alignment Procedure

The CTX-2400 has been fully aligned at the factory before shipment to you and does not normally require further adjustment. When necessary, however, the unit may be aligned as indicated here in after. It is recommended that you do not try to adjust any circuit in this radiotelephone unless you entirely understand circuit operation and have enough experience in this field of marine radiotelephone and high quality test equipment. Since the radiotelephone is most precise and sophisticated, tampering with the unit may cause upsetting the alignment and lowers its performance.

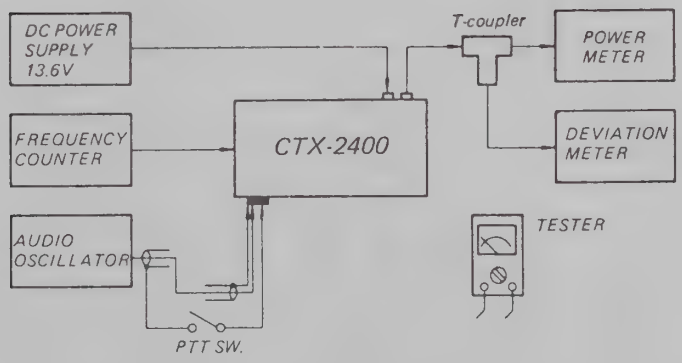
Equipment Required

Following equipment are required for the alignment.

1) Regulated DC Power Supply, 0 – 20V, 10A or higher.
2) Audio Signal Generator, 10 Hz – 20 kHz.
3) RF VTVM, Probe type, 150 MHz.
4) Circuit Tester or Digital Voltmeter.
5) Frequency Counter, 0 – 250 MHz, high impedance input.
6) Deviation Meter.
7) Synchroscope.
8) RF Dummy Resistor, 50 ohms, 30W.
9) RF Power Meter, 50 ohms impedance, 25W or higher.
10) T-coupler.
11) Nonmetallic drivers, as shown.



Transmitter Alignment Test Setup

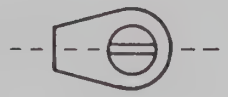


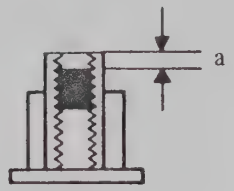
PLL Circuit Alignment

Preliminary Adjustment

Set trimming capacitors and RF transformer cores as following before starting the alignment:

CT1-CT4 L8: a = 3/64" T14: a = 0 T15: a = 15/64" T16: a = 5/64"





VCO Frequency-Shift Voltage Check

Connect circuit tester across R27 (C46 side) and ground.

Test Equipment	Unit	Adjust	Remarks
	RX mode, channel 06. (Simplex mode) RX mode, channel 28. (Duplex mode) TX mode, any channel.	(Check) (Check) (Check)	Check for about 1.1V. Check for about 2.4V. Check for about 5.5V.

VCO Control Voltage – Pre-adjustment

Connect circuit tester across TP5 and ground.

Test Equipment	Unit	Adjust	Remarks
	RX mode, channel 06.	L8	Adjust L8 for 2.0V.

VCO Buffer/Mixer Alignment

Connect synchroscope across L12 (C103 side) and ground through a probe.

Test Equipment	Unit	Adjust	Remarks
	TX mode (Depress PTT bar on mic), channel 28.	T15, T16	Adjust T15 and T16 for maximum (0.3 Vp-p), sharply-defined display without no ghost.

Reference Oscillator (12.8 MHz) Alignment

Connect frequency counter across U5 (PLL02) #2 pin and ground.

Test Equipment	Unit	Adjust	Remarks
	RX mode, channel 28.	CT1	Adjust for 3.400000 MHz.

Receiver Local Oscillator Alignment

Connect frequency counter across Q11 collector and ground.

Test Equipment	Unit	Adjust	Remarks
	RX mode, channel 16 (Simplex mode). RX mode, channel 28 (Duplex mode).	CT4 CT3	Adjust for 145.100300 MHz ± 50 Hz. Adjust for 150.300300 MHz ± 50 Hz.

Transmitter Alignment

Depress PTT switch on microphone to set unit to TX mode.

TX Buffer (Q24)/Driver (Q25) Adjustment

Connect tester across TP6 and ground, then TP7 and ground.

Test Equipment	Unit	Adjust	Remarks
	TX mode, channel 16, Power/Hi-Lo switch to Hi (25W).	(Temporarily, set RV2 and RV3 fully clock-wise.) T17, T18. T19, T20.	Adjust T17 and T18 for maximum (1.1–1.5V) Connect tester across TP7 and ground. Adjust T19 and T20 for maximum (0.2–0.4V).

RF Driver/Power Amplifier Adjustment/APC Adjustment

Connect Wattmeter across antenna and ground.

Test Equipment	Unit	Adjust	Remarks
	TX mode, channel 16, Power/Hi-Lo switch to Hi (25W). Set Power/Hi-Lo switch to Lo (1W).	CT5, CT6, CT7 and CT8. RV2 RV3	Adjust CT5, CT6, CT7 and CT8 for maximum power on Wattmeter. Repeat as necessary. Adjust RV2 for 25W RF power output. Adjust RV3 for 0.8W RF power output.

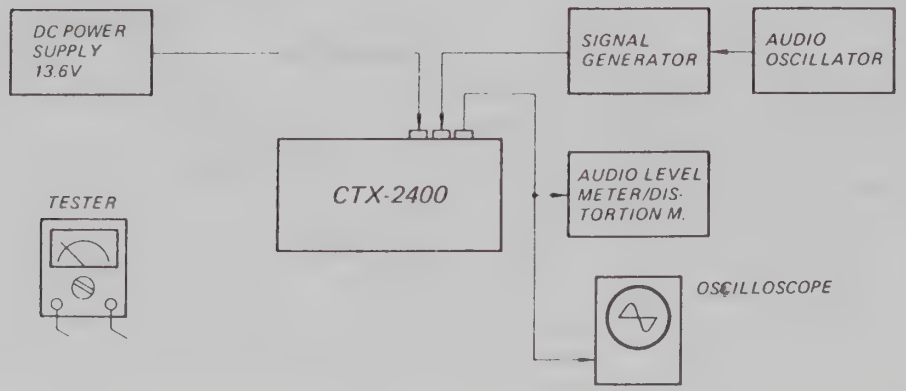
Maximum Frequency Deviation Alignment

Connect deviation meter across T-type CM-coupler which is connected to antenna and ground. Connect audio signal generator to microphone input circuit.

Test Equipment	Unit	Adjust	Remarks
Audio signal generator output to microphone input circuit, 1,000 Hz 100 mV audio, then 1,000 Hz 3 mV audio.	TX mode, channel 16.	RV1	Adjust RV1 for 4.8 kHz deviation. Reduce audio generator output down to 3 mV. Check deviation meter gives more than 3 kHz deviation.

TX Frequency Alignment Connect frequency counter across Q24 collector and ground.			
Test Equipment	**Unit**	**Adjust**	**Remarks**
	TX mode (Depress PTT bar on mic), ch 16.	CT2	Adjust CT2 for 156.800300 MHz ± 50 Hz.
VCO Control Voltage Alignment Connect circuit tester across TP5 and ground.			
Test Equipment	**Unit**	**Adjust**	**Remarks**
	RX mode, channel 06.	L8	Adjust L8 for 2.0V.

Receiver Alignment Test Setup



Receiver Alignment

Set the squelch control fully counterclockwise and the volume control to about 1 o'clock position.

Local Oscillator Level Adjustment

Connect tester across TP1 and ground.

Test Equipment	Unit	Adjust	Remarks
	RX mode, channel 16.	T11, T12, T13.	Adjust T11, T12, and T13 for maximum reading on tester (1.8 – 2.5V).
	RX mode, channel 28.	T12	Adjust T12 for maximum reading (1.8 – 2.5V).

RF Amplifier/Mixers Adjustment

Connect tester across TP3 and ground.

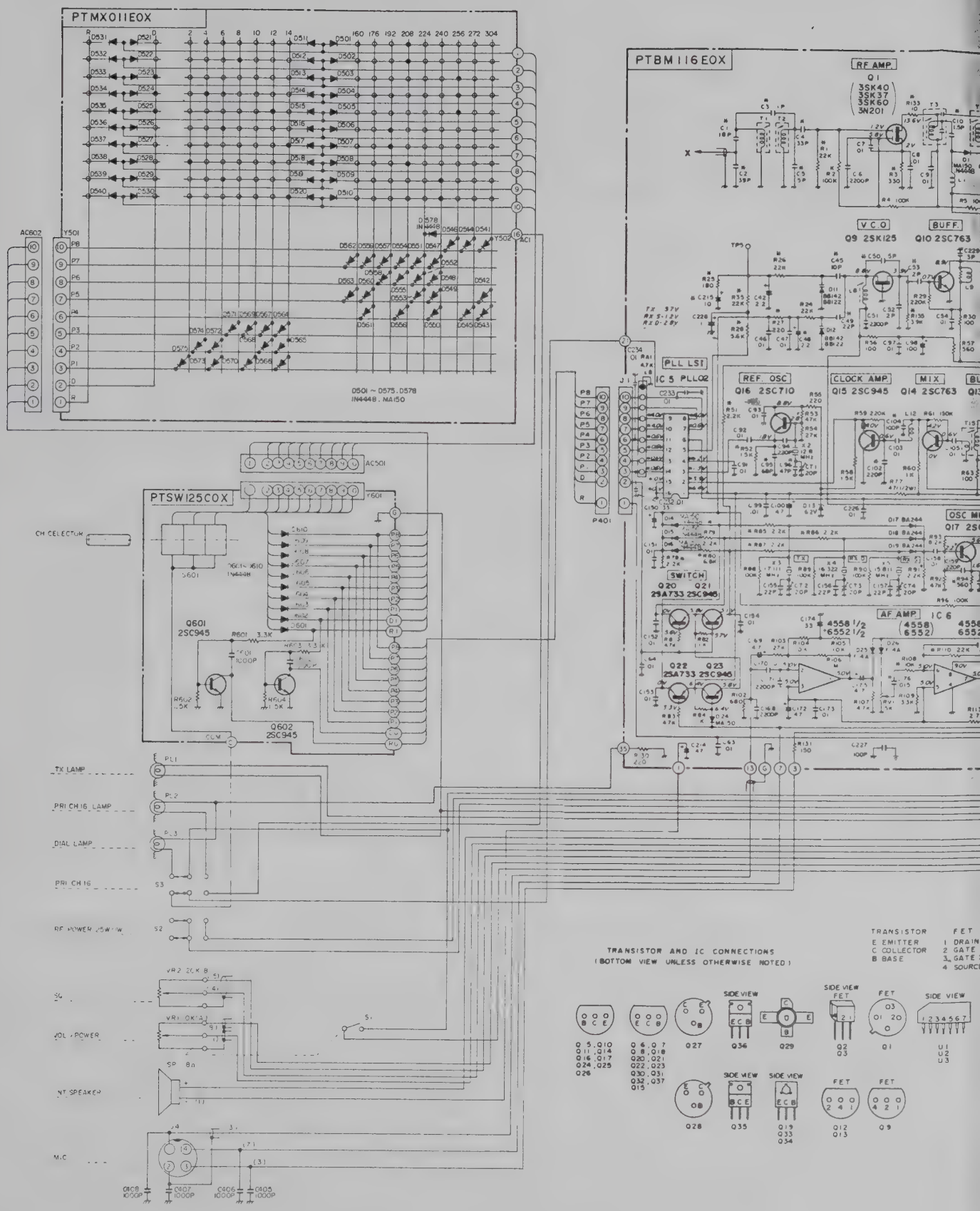
Test Equipment	Unit	Adjust	Remarks
FM signal generator output, 156.800 MHz, to antenna input.	RX mode, channel 16.	T1, T2, T3, T4, T5, T6, T7, and T8.	Adjust T1 thru T8 for maximum reading on tester. Tester reading will be gradually increased. Keep the reading within 1.5–2.5V by accordingly reducing generator output level.
	RX mode, channel 28.	T2	Adjust T2 for maximum.

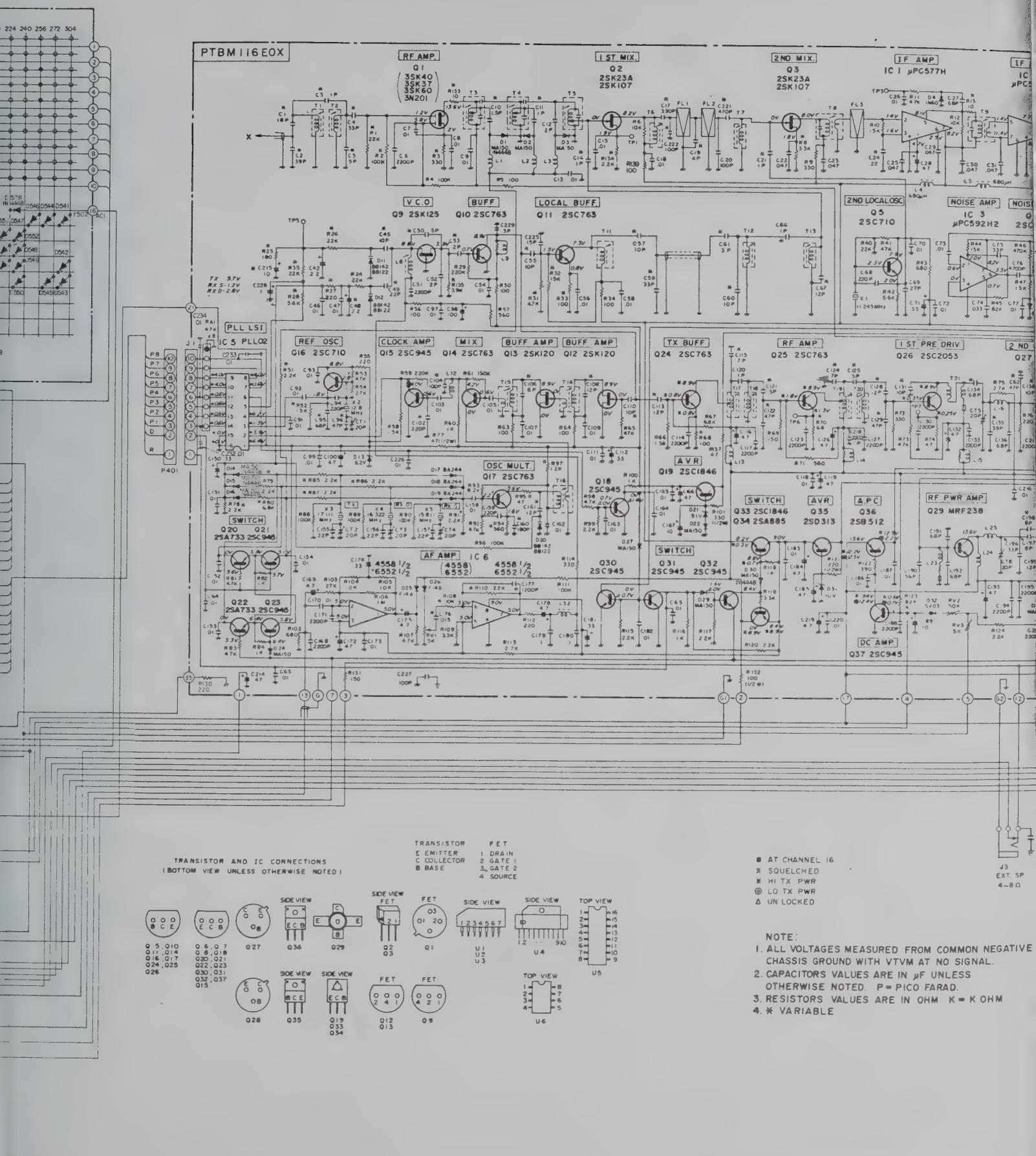
IF Amplifier Adjustment (IF = 11.7 MHz, 455 kHz)

Connect tester across TP3 and ground.

Test Equipment	Unit	Adjust	Remarks
(Remove generator output.)	RX mode, no signal.	T6, T7, T8.	Adjust T6, T7 and T8 for maximum reading.

Schematic Diagram





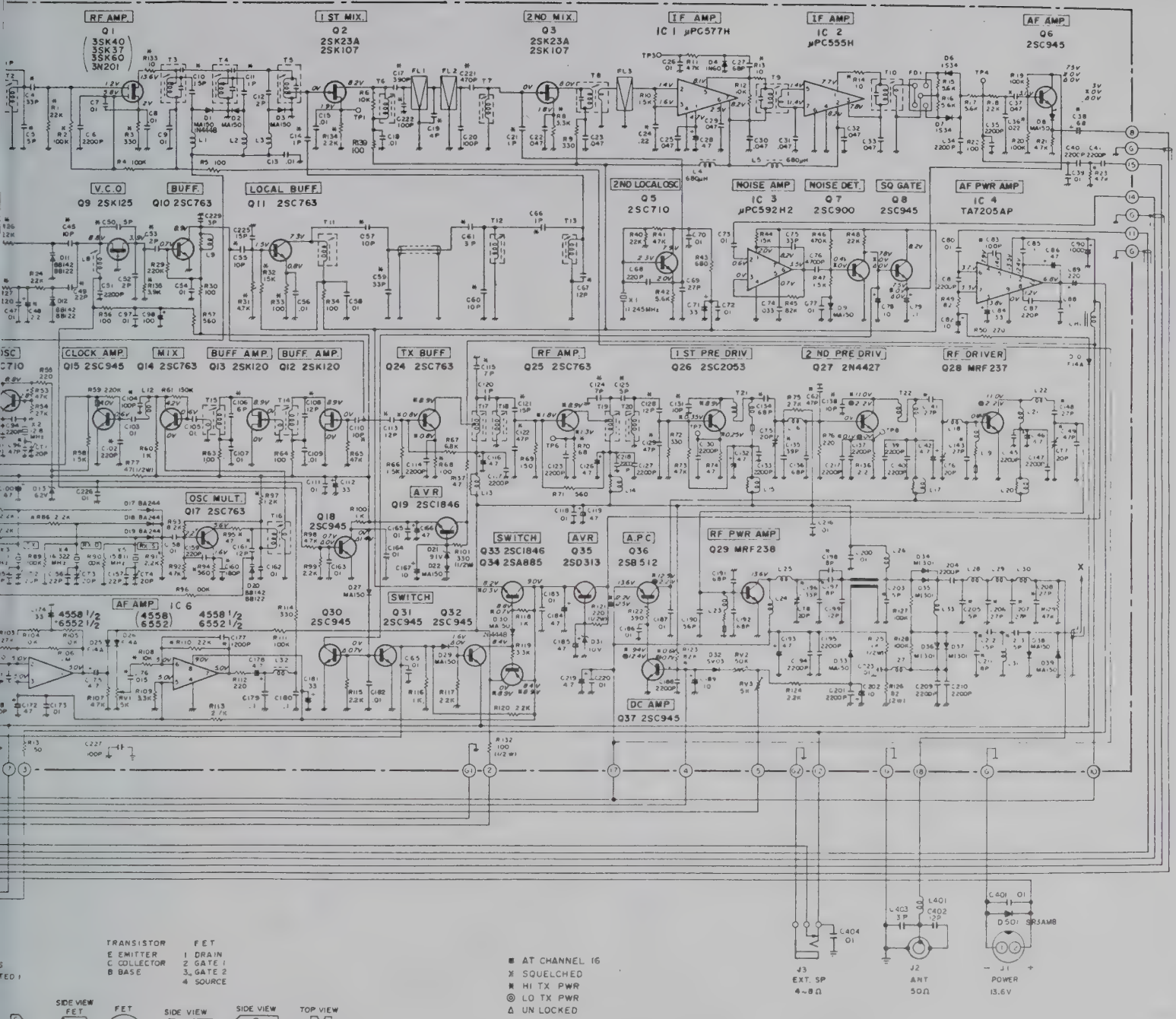
TRANSISTOR AND IC CONNECTIONS
(BOTTOM VIEW UNLESS OTHERWISE NOTED)

TRANSISTOR
E EMITTER
C COLLECTOR
B BASE

FET
1 DRAIN
2 GATE 1
3 GATE 2
4 SOURCE

■ AT CHANNEL 16
X SQUELCHED
✱ HI TX PWR
◎ LO TX PWR
Δ UN LOCKED

NOTE:
1. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE CHASSIS GROUND WITH VTVM AT NO SIGNAL.
2. CAPACITORS VALUES ARE IN μF UNLESS OTHERWISE NOTED. P = PICO FARAD.
3. RESISTORS VALUES ARE IN OHM K = K OHM
4. ✱ VARIABLE



TRANSISTOR
E EMITTER
C COLLECTOR
B BASE

FET
1 DRAIN
2 GATE 1
3 GATE 2
4 SOURCE

■ AT CHANNEL 16
✕ SQUELCHED
■ HI TX PWR
◎ LO TX PWR
Δ UN LOCKED

NOTE:
1. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE CHASSIS GROUND WITH VTVM AT NO SIGNAL.
2. CAPACITORS VALUES ARE IN μF UNLESS OTHERWISE NOTED. P = PICO FARAD.
3. RESISTORS VALUES ARE IN OHM K = K OHM
4. ✕ VARIABLE

PC Board Details

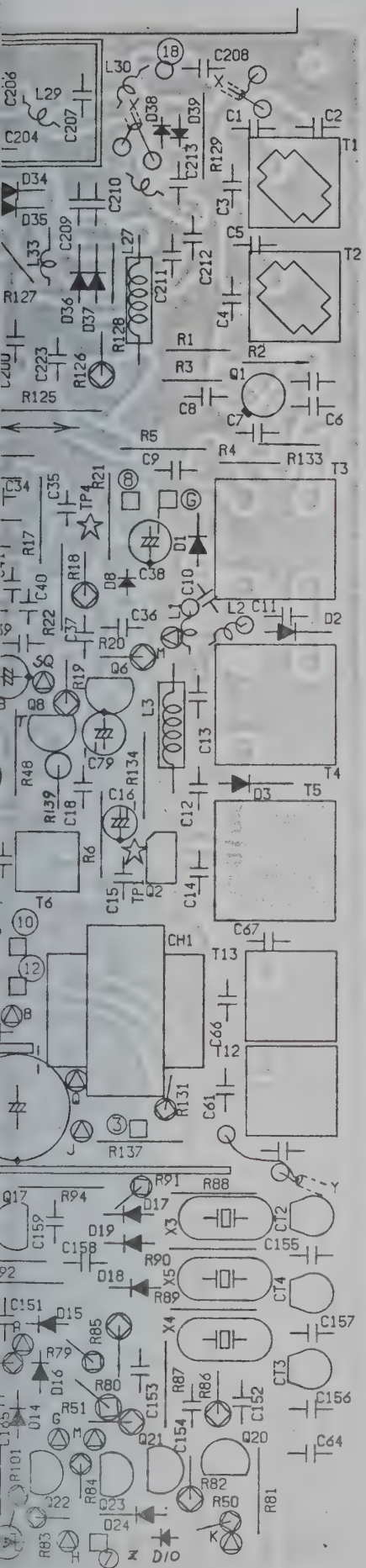
PTMX011EOX FPK

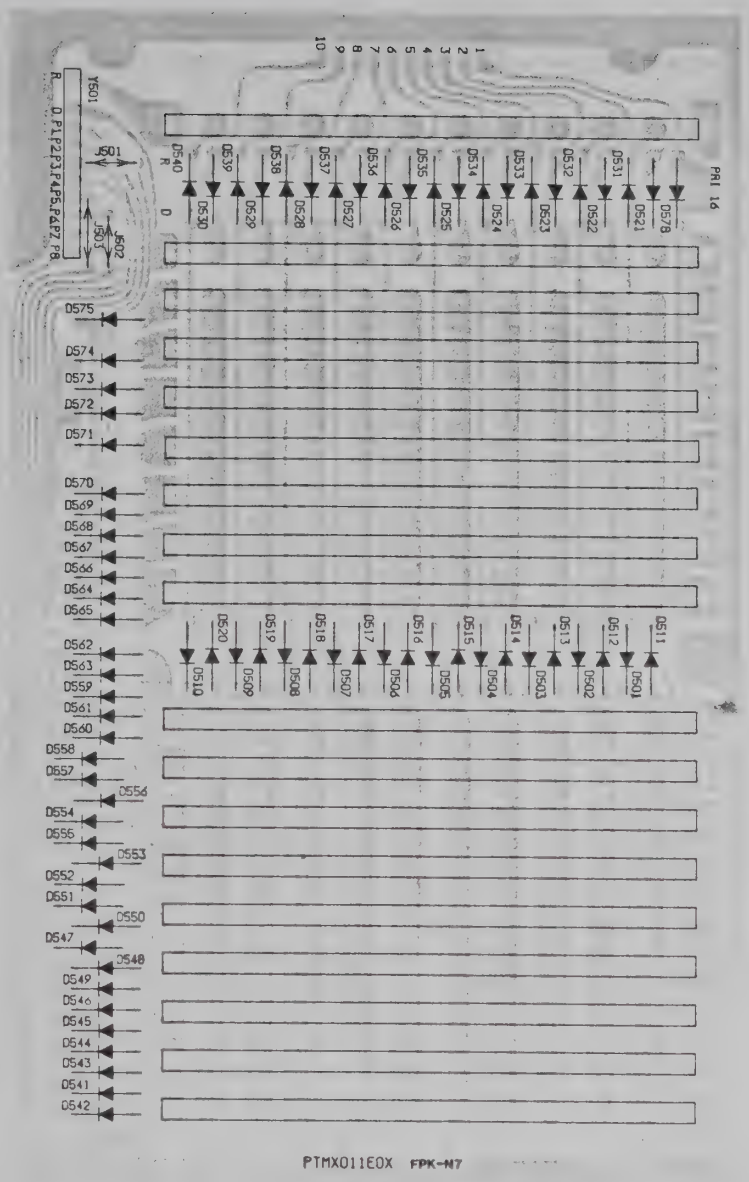
Channel Matrix Board (

Channel Selector Board

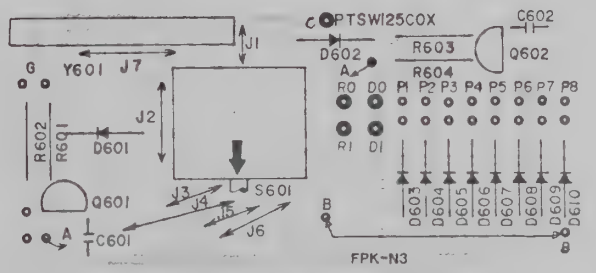
PTSW130CO

(PTSW130)

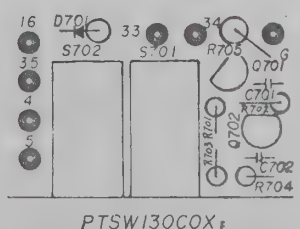




Channel Matrix Board (PTMX011)



Channel Selector Board (PTSW125)



(PTSW130)

Replacement Part List

	PART NAME	PART CODE	
	ELEC. ELEMENTS	EMB52AACAL1	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				QTY USED
1		ACCN130GEA		CONN. CORD ASSY		AC1				1
2	EXPLODED	APTBM116CA		P.W.BOARD ASSY						1
3	EXPLODED	APTMX011AA		P.W.BOARD ASSY						1
4	EXPLODED	APTSW125AA		P.W.BOARD ASSY						1
5		CCDE030CCM		CERAMIC CAP.	CJ 3PF 500V -0.25, +0.25PF	C403				1
6		CCDE120KCM		CERAMIC CAP.	12PF 500V -10, +10% CH	C402				1
7		CKDB102PEM		CERAMIC CAP.	1000PF 50V -0, +100% E	C405	C406	C407	C408	4
8		CKDB103KBU		CERAMIC CAP.	0.01MFD 50V -10, +10% B	C401				1
9		CKDB103PEM		CERAMIC CAP.	0.01MFD 50V -0, +100% E	C404	C409			2
10		GTX2400A01		WIRES KIT						1
11		LA1GG0703A		RF COIL		L401				1
12		MS325BC004		GND. WASHER						1
13		QDSSR3AM8E		SI-DIODE	SR3AM8	D401				1
14		RVNA203B08		VR.		VR2				1
15		RVNB103A12		VR.		VR1/S1				1
16		SP02FAX04A		PUSH SWITCH		S2				1
17		YJC02S003Z		COAXIAL JACK		J2				1
18		YJT03S003Z		3P JACK		J3				1
19		YJZ02S004Z		DC JACK		J1				1
20		YJZ04S008Z		4P MIC JACK		J4				1
21		ZPA064101U		LAMP		PL1	PL2	PL3		3

	PART NAME	PART CODE	
	P.W.BOARD ASSY	APTBM116CA	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		BNHCL30NSN		NUT	M3, S-NI, THIN-TYPE					3
2		BSPB30C8NN		BIND HEAD SCREW	(+)BIT, M3 X 8 S-NI					3
3		BSPB3010NN		BIND HEAD SCREW	(+)BIT, M3 X 10 S-NI					2
4		BSPC3008NS		CEMS SCREW	(+)BIT, M3 X 8 BS-NI					1
5		BSPP3006NT		PAN HEAD SCREW	(+)BIT, M3 X 6 PLASTIC					2
6		BSPU3006NN		THIN BIND SCREW	(+)BIT, M3 X 6 S-NI					1
7		BWU30655SW		IT. LOCK WASHER	INSIDE TOOTHED, 3 M/M S-ZN					1
8		CBD1B104MM		CERAMIC CAP.	0.1MFD 12.5V -20, +20%	C85	C88			2
9		CCDB0R5CAM		CERAMIC CAP.	AK 0.5PF 50V -0.25, +0.25PF	C125				1
10		CCDB010CCM		CERAMIC CAP.	CK 1PF 50V -0.25, +0.25PF	C120	C14	C21	C3	5
11	.					C66				
12		CCDB010CPM		CERAMIC CAP.	PK 1PF 50V -0.25, +0.25PF	C11				1
13		CCDB020CCM		CERAMIC CAP.	CK 2PF 50V -0.25, +0.25PF	C52	C53			2
14		CCDB020CPM		CERAMIC CAP.	PK 2PF 50V -0.25, +0.25PF	C12				1
15		CCDB030CCM		CERAMIC CAP.	CJ 3PF 50V -0.25, +0.25PF	C61				1
16		CCDB030CPM		CERAMIC CAP.	PJ 3PF 50V -0.25, +0.25PF	C229				1
17		CCDB040CCM		CERAMIC CAP.	CH 4PF 50V -0.25, +0.25PF	C19				1
18		CCDB050CCM		CERAMIC CAP.	CH 5PF 50V -0.25, +0.25PF	C50				1
19		CCDB050DPM		CERAMIC CAP.	PH 5PF 50V -0.5, +0.5PF	C5				1
20		CCDB060DPM		CERAMIC CAP.	PH 6PF 50V -0.5, +0.5PF	C106				1
21		CCDB070DPM		CERAMIC CAP.	PH 7PF 50V -0.5, +0.5PF	C115	C124			2

	PART NAME	PART CODE	
	P.W.BOARD ASSY	APTBM116CA	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		CCDB1R5CPM		CERAMIC CAP.	PK 1.5PF 50V -0.25, +0.25PF	C10				1
2		CCDB100DPM		CERAMIC CAP.	PH 10PF 50V -0.5, +0.5PF	C131	C45	C57	C60	4
3		CCDB100DOM		CERAMIC CAP.	SL 10PF 50V -0.5, +0.5PF	C110	C55			2
4		CCDB101KPM		CERAMIC CAP.	100PF 50V -10, +10% PH	C20	C222			2
5		CCDB101KOM		CERAMIC CAP.	100PF 50V -10, +10% SL	C104	C227	C83		3
6		CCDB120KPM		CERAMIC CAP.	12PF 50V -10, +10% PH	C108	C128	C161	C67	4
7		CCDB120KOM		CERAMIC CAP.	12PF 50V -10, +10% SL	C113				1
8		CCDB150KPM		CERAMIC CAP.	15PF 50V -10, +10% PH	C121				1
9		CCDB150KOM		CERAMIC CAP.	15PF 50V -10, +10% SL	C225				1
10		CCDB180KPM		CERAMIC CAP.	18PF 50V -10, +10% PH	C1				1
11		CCDB181KUM		CERAMIC CAP.		C160				1
12		CCDB220KPM		CERAMIC CAP.	22PF 50V -10, +10% PH	C155	C156	C157	C49	4
13		CCDB221KUM		CERAMIC CAP.	220PF 50V -10, +10% UJ	C159	C68	C94		3
14		CCDB221KOM		CERAMIC CAP.	220PF 50V -10, +10% SL	C102	C87			2
15		CCDB270KUM		CERAMIC CAP.		C69				1
16		CCDB330KPM		CERAMIC CAP.	33PF 50V -10, +10% PH	C4	C59			2
17		CCDB330KOM		CERAMIC CAP.	33PF 50V -10, +10% SL	C75				1
18		CCDB390KCM		CERAMIC CAP.	39PF 50V -10, +10% CH	C135				1
19		CCDB390KPM		CERAMIC CAP.	39PF 50V -10, +10% PH	C2				1
20		CCDB391KOM		CERAMIC CAP.	390PF 50V -10, +10% SL	C17				1
21		CCDB470KCM		CERAMIC CAP.	47PF 50V -10, +10% CH	C62				1

	PART NAME	PART CODE	
	P.W.BOARD ASSY	APTBM116CA	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				QTY USED
1		CCDB470KPM		CERAMIC CAP.	47PF 50V -10, +10% PH	C122	C129	C96		3
2		CCDB471KOM		CERAMIC CAP.	470PF 50V -10, +10% SL	C221				1
3		CCDB680KCM		CERAMIC CAP.	68PF 50V -10, +10% CH	C134	C136			2
4		CCDB680KUM		CERAMIC CAP.	68PF 50V -10, +10% UJ	C95				1
5		CCDB680KOM		CERAMIC CAP.	68PF 50V -10, +10% SL	C27				1
6		CCDE050CCM		CERAMIC CAP.	CH 5PF 500V -0.25, +0.25PF	C203				1
7		CCDE080DCM		CERAMIC CAP.		C197	C198	C211		3
8		CCDE100DCM		CERAMIC CAP.	CH 10PF 500V -0.5, +0.5PF	C138				1
9		CCDE120KCM		CERAMIC CAP.	12PF 500V -10, +10% CH	C199				1
10		CCDE150KCM		CERAMIC CAP.	15PF 500V -10, +10% CH	C205	C212	C213		3
11		CCDE270KCM		CERAMIC CAP.	27PF 500V -10, +10% CH	C141	C143	C148	C206	6
12						C207	C208			
13		CCDE330KCM		CERAMIC CAP.	33PF 500V -10, +10% CH	C196				1
14		CCDE470KCM		CERAMIC CAP.	47PF 500V -10, +10% CH	C149				1
15		CCDE560KCM		CERAMIC CAP.	56PF 500V -10, +10% CH	C190				1
16		CCDE680KCM		CERAMIC CAP.	68PF 500V -10, +10% CH	C191	C192			2
17		CEAC101ZMN		ELYT. CAPACITOR	100MFD 10V MS	C98				1
18		CEAC330ZMN		ELYT. CAPACITOR		C112	C150	C174	C181	6
19						C71	C84			
20		CEAC470ZMN		ELYT. CAPACITOR		C100	C119	C166	C172	7
21						C184	C185	C231		

	PART NAME	PART CODE	
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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		CEAD100ZMN		ELYT. CAPACITOR	10MFD 16V MS	C167	C189	C202	C78	5
2						C82				
3		CEAD102ALX		ELYT. CAPACITOR	1000MFD 16V	C90				1
4		CEAD221ZLS		ELYT. CAPACITOR	220MFD 16V SP	C89				1
5		CEAD470ZMN		ELYT. CAPACITOR	47MFD 16V MS	C86				1
6		CEAE4R7ZMN		ELYT. CAPACITOR	4.7MFD 25V MS	C116	C126	C132	C142	11
7						C146	C169	C175	C178	
8						C193	C219	C28		
9		CEAF470ZLS		ELYT. CAPACITOR	47MFD 25V SP	C214				1
10		CEAG0R1ZMN		ELYT. CAPACITOR	0.1MFD 50V MS	C79				1
11		CKDB103KBU		CERAMIC CAP.	0.01MFD 50V -10, +10% B	C186	C187	C220	C46	8
12						C47	C7	C8	C9	
13		CKDB103PEM		CERAMIC CAP.	0.01MFD 50V -0, +100% E	C103	C105	C107	C109	42
14						C111	C118	C13	C15	
15						C151	C152	C153	C154	
16						C158	C162	C163	C164	
17						C165	C173	C18	C182	
18						C183	C200	C216	C218	
19						C223	C226	C230	C232	
20						C233	C234	C54	C56	
21						C58	C63	C64	C65	

	PART NAME	PART CODE	
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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1						C70	C72	C91	C92	
2						C93	C97			
3		CKDE222KBM		CERAMIC CAP.		C114	C117	C123	C127	21
4						C130	C133	C137	C139	
5						C140	C145	C147	C188	
6						C194	C195	C201	C204	
7						C209	C210	C217	C51	
8						C6				
9		CQMB103KEH		MYLAR CAPACITOR	0.01MFD 50V -10, +10%	C170	C26	C39	C73	7
10						C77	C80	C99		
11		CQMB104KEH		MYLAR CAPACITOR	0.1MFD 50V -10, +10%	C179	C180			2
12		CQMB122KEH		MYLAR CAPACITOR	1200PF 50V -10, +10%	C177				1
13		CQMB153KEH		MYLAR CAPACITOR	0.015MFD 50V -10, +10%	C176				1
14		CQMB222KEH		MYLAR CAPACITOR	2200PF 50V -10, +10%	C168	C171	C34	C35	7
15						C40	C41	C81		
16		CQMB223KEH		MYLAR CAPACITOR	0.022MFD 50V -10, +10%	C36				1
17		CQMB224KEH		MYLAR CAPACITOR	0.22MFD 50V -10, +10%	C24				1
18		CQMB333KEH		MYLAR CAPACITOR	0.033MFD 50V -10, +10%	C74				1
19		CQMB472KEH		MYLAR CAPACITOR	4700PF 50V -10, +10%	C76				1
20		CQMB473KEH		MYLAR CAPACITOR	0.047MFD 50V -10, +10%	C22	C23	C25	C29	9
21						C30	C31	C32	C33	

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1						C37				
2		CSSF4R7MDC		TANTALUM CAP.	4.7MFD 25V -20, +20%	C235				1
3		CSSFR68MDN		TANTALUM CAP.	0.68MFD 35V -20, +20%	C38				1
4		CSSF010MDN		TANTALUM CAP.	1MFD 35V -20, +20%	C228	C42			2
5		CSSF100MDN		TANTALUM CAP.	10MFD 35V -20, +20%	C215				1
6		CSSF2R2MDN		TANTALUM CAP.	2.2MFD 35V -20, +20%	C48				1
7		CTZA200K01		TRIMMER CAP.		CT8				1
8		CTZ620H01		TRIMMER CAP.		CT1	CT2	CT3	CT4	4
9		CTZ7200K01		TRIMMER CAP.		CT5	CT6	CT7		3
10		FBR455F11M		CERAMIC FILTER		FL3				1
11		FF11R7F03A		XTAL FILTER		FL1	FL2			2
12		FZR455A01M		CERAMIC FILTER		FD1				1
13		LA1EE0708A		RF COIL		L21				1
14		LA1GE0701A		RF COIL		L18				1
15		LA1GG0703A		RF COIL		L28	L29	L30	L31	5
16						L33				
17		LCADA3038A		RF COIL		L26	L27			2
18		LDADB3610T		RF. COIL		L9				1
19		LDADB3622N		RF COIL		L13	L14	L20		3
20		LDADD3604R		RF COIL		L15	L17			2
21		LF100KE02T		CHOKE COIL		L1	L12	L2	L3	4

	PART NAME	PART CODE	
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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				QTY USED
1		LF563JC02S		RF COIL		L32				1
2		LF681JC01K		RF COIL		L4	L5			2
3		LJ119H004W		CHOKE COIL		CH1				1
4		LL2CN1001A		RF COIL.		L22				1
5		LL2GM1001A		RF COIL		L16				1
6		LL2JR1001A		RF COIL		L25				1
7		LL6JR1502A		RF COIL		L24				1
8		LMBDC1502V		RF COIL		L23				1
9		LNBBC1504U		RF COIL		L19				1
10		LZ5RE15C1Z		RF COIL		T21	T22			2
11		MB222BN001		COIL CASE						2
12		MB332SD001		SHEILD						1
13		MB433SN001		SHEILD						1
14		MB433SN002		SHEILD CASE						1
15		MB433SN003		SHEILD COVER						1
16		MB543SD001		SHEILD						1
17		MB544SD001		SHEILD						1
18		ML353SD001		SHEILD						1
19		ML354SD002		SHEILD						1
20		ML365SD001		SHEILD						1
21		ML543AD004		HEAT SINK						1

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		MS327AD0C4		HEAT SINK						1
2		MT260AQ001		HEAT SINK						1
3		MU644AD002		HEAT SINK						1
4		MW201BS001		TERMINAL						19
5		MW401CX003		SHORT JUMPER						3
6		MW401CX004		SHORT JUMPER	JW-5					3
7		MW401CX006		SHOT JAMPER	10MM					7
8		MX326CS001		HEAT SINK						1
9		MX415SS001		CLAMPER						1
10		PTBM116E0X		PRINTED W.BOARD						1
11		QDCBB122X0		VARI-CAP. DIODE	BB-122 28V NO-RANK 26MIN	D11	D12	D20		3
12		QDG1N60XXT		GERMANIUM DIODE	1N60 NO-RANK	D4				1
13		QDG1S34XXT		GERMANIUM DIODE	1S34 NO-RANK	D6	D7			2
14		QDSBA244XQ		SI DIODE	BS244A	D17	D18	D19		3
15		QDSF14AXXA		SILICON DIODE	F14A NO-RANK	D10	D25	D26		3
16		QDSMA150XN		SILICON DIODE	MA150 VF=1.2V,VR=35V NO-RANK 24MIN	D1	D14	D15	D16	16
17						D2	D22	D24	D27	
18						D29	D3	D30	D33	
19						D38	D39	D8	D9	
20		QDSM1301XE		SILICON DIODE	MI301-01-A VR=80V NO-RANK 26MIN	D34	D35	D36	D37	4
21		QDZRD10EBA		ZENER DIODE	RD10EB2 VZ=9.52-9.80V B-RANK25MIN	D31				1

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		QDZRD6EXXA		ZENER DIODE	RD6.2E 5.8-6.6V NO-RANK	D13				1
2		QDZRD9EXBA		ZENER DIODE	RD9.1E VZ=9.12-9.68V B-RANK	D21				1
3		QQM00555BA		I.C.	UPC555H	U2				1
4		QQM00577AA		I.C.	UPC577H	U1				1
5		QQM00592AA		I.C.	UPC592H2 E,F,H-RANK AF-AMP	U3				1
6		QQM04558AJ		I.C.	NJM4558D OPERATIONAL AMP.	U6				1
7		QQM07205DT		I.C.	TA7205AP-C 5.8W AUDIO-POWER-AMP	U4				1
8		QQOPLL02AN		I.C.	PLL02A(MN6040)	U5				1
9		QTA0733XAA		TRANSISTOR	2SA733 Q-RANK	Q20	Q22			2
10		QTA0885XAN		TRANSISTOR	2SA885 Q,R,S-RANK	Q34				1
11		QTB0512XAN		TRANSISTOR	2SB512 P-RANK	Q36				1
12		QTC0710XBE		TRANSISTOR	2SC710 D-RANK	Q16	Q5			2
13		QTC0763XAE		TRANSISTOR	2SC763 C,D-RANK	Q10	Q11	Q14	Q17	6
14						Q24	Q25			
15		QTC0900XBA		TRANSISTOR	2SC900 E-RANK	Q7				1
16		QTC0945LAA		TRANSISTOR	2SC945L P,Q-RANK	Q15	Q18	Q21	Q23	10
17						Q30	Q31	Q32	Q37	
18						Q6	Q8			
19		QTC1846XAN		TRANSISTOR	2SC1846 Q,R,S-RANK	Q19	Q33			2
20		QTC2053XAE		TRANSISTOR	2SC2053 NO-RANK	Q26				1
21		QTD0313XBC		TRANSISTOR	2SD313 E-RANK	Q35				1

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		QTF0237XAM		TRANSISTOR	MRF237 NO-RANK (RF.PWR. 8W.MAX)	Q28				1
2		QTF0238XAM		TRANSISTOR	MRF238 NO-RANK (RF.PWR. 30W.MAX)	Q29				1
3		QTK0023AAS		TRANSISTOR	2SK23A 540	Q2	Q3			2
4		QTK0120XAS		TRANSISTOR	2SK120 2-RANK	Q12	Q13			2
5		QTK0125XAS		TRANSISTOR	2SK125 S-RANK	Q9				1
6		QTL3N201BM		TRANSISTOR	3N201B	Q1				1
7		QTN4427XAM		TRANSISTOR	2N4427 NO-RANK	Q27				1
8		QVESV03XXD		VARISTOR	SV03 NO-RANK (VF:1.60V-2.00V)	D32				1
9		RAB472K08N		R ARRAY		RA1				1
10		RC18GK100X		FIXED CARBON R.	1/8W 10 OHM 10%	R133				1
11		RC18GK104X		FIXED CARBON R.	1/8W 100K OHM 10%	R127	R128	R2	R4	4
12		RC18GK223X		FIXED CARBON R.	1/8W 22K OHM 10%	R1				1
13		RC18GK331X		FIXED CARBON R.	1/8W 330 OHM 10%	R3				1
14		RD25PJ100X		CARBON FILM R.	0.25W 10 OHM 5%	R13	R14			2
15		RD25PJ101X		CARBON FILM R.	0.25W 100 OHM 5%	R22	R30	R33	R34	6
16						R5	R68			
17		RD25PJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R116	R118	R60		3
18		RD25PJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R104	R105	R108	R12	5
19						R6				
20		RD25PJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R111	R88	R89	R90	4
21		RD25PJ105X		CARBON FILM R.	0.25W 1M OHM 5%	R106				1

	PART NAME	PART CODE	
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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		RD25PJ122X		CARBON FILM R.	0.25W 1.2K OHM 5%	R97				1
2		RD25PJ151X		CARBON FILM R.	0.25W 150 OHM 5%	R69				1
3		RD25PJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R10	R47	R52	R58	5
4						R66				
5		RD25PJ153X		CARBON FILM R.	0.25W 15K OHM 5%	R32	R44			2
6		RD25PJ181X		CARBON FILM R.	0.25W 180 OHM 5%	R25				1
7		RD25PJ2R2X		CARBON FILM R.	0.25W 2.2 OHM 5%	R136				1
8		RD25PJ221X		CARBON FILM R.	0.25W 220 OHM 5%	R112	R27	R76		3
9		RD25PJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R115	R117	R120	R124	6
10						R134	R87			
11		RD25PJ223X		CARBON FILM R.	0.25W 22K OHM 5%	R110	R24	R26	R40	5
12						R48				
13		RD25PJ224X		CARBON FILM R.	0.25W 220K OHM 5%	R29	R59			2
14		RD25PJ272X		CARBON FILM R.	0.25W 2.7K OHM 5%	R113	R75			2
15		RD25PJ273X		CARBON FILM R.	0.25W 27K OHM 5%	R103				1
16		RD25PJ331X		CARBON FILM R.	0.25W 330 OHM 5%	R114	R72	R9		3
17		RD25PJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R109	R119	R8		3
18		RD25PJ391X		CARBON FILM R.	0.25W 390 OHM 5%	R122				1
19		RD25PJ392X		CARBON FILM R.	0.25W 3.9K OHM 5%	R135				1
20		RD25PJ4R7X		CARBON FILM R.	0.25W 4.7 OHM 5%	R137	R74			2
21		RD25PJ471X		CARBON FILM R.	0.25W 470 OHM 5%	R35				1

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		RD25PJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R107	R11	R21	R23	9
2						R31	R73	R81	R92	
3						R98				
4		RD25PJ473X		CARBON FILM R.	0.25W 47K OHM 5%	R129	R41			2
5		RD25PJ474X		CARBON FILM R.	0.25W 470K OHM 5%	R46				1
6		RD25PJ561X		CARBON FILM R.	0.25W 560 OHM 5%	R71	R94			2
7		RD25PJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R15	R16	R17	R42	4
8		RD25PJ680X		CARBON FILM R.	0.25W 68 OHM 5%	R70				1
9		RD25PJ681X		CARBON FILM R.	0.25W 680 OHM 5%	R102	R43			2
10		RD25PJ682X		CARBON FILM R.	0.25W 6.8K OHM 5%	R67				1
11		RD25PJ820X		CARBON FILM R.	0.25W 82 OHM 5%	R49				1
12		RD25PJ822X		CARBON FILM R.	0.25W 8.2K OHM 5%	R93				1
13		RD25PJ823X		CARBON FILM R.	0.25W 82K OHM 5%	R123	R45			2
14		RD25P0000D		CARBON R.						1
15		RD25VJ101X		CARBON FILM R.	0.25W 100 OHM 5%	R139	R56	R63	R64	4
16		RD25VJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R100	R82	R84		3
17		RD25VJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R19	R20	R96		3
18		RD25VJ151X		CARBON FILM R.	0.25W 150 OHM 5%	R131				1
19		RD25VJ154X		CARBON FILM R.	0.25W 150K OHM 5%	R61				1
20		RD25VJ221X		CARBON FILM R.	0.25W 220 OHM 5%	R50	R55			2
21		RD25VJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R51	R78	R79	R85	7

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1						R86	R91	R99		
2		RD25VJ223X		CARBON FILM R.	0.25W 22K OHM 5%	R18				1
3		RD25VJ273X		CARBON FILM R.	0.25W 27K OHM 5%	R54				1
4		RD25VJ470X		CARBON FILM R.	0.25W 47 OHM 5%	R95				1
5		RD25VJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R83				1
6		RD25VJ473X		CARBON FILM R.	0.25W 47K OHM 5%	R53	R65			2
7		RD25VJ561X		CARBON FILM R.	0.25W 560 OHM 5%	R57				1
8		RD25VJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R28				1
9		RD25VJ682X		CARBON FILM R.	0.25W 6.8K OHM 5%	R80				1
10		RGHANJ221B		M-OXIDE FILM R.	1/2W 220 OHM 5%	R121				1
11		RGHANJ331B		M-OXIDE FILM R.	1/2W 330 OHM 5%	R101				1
12		RGHANJ470B		M-OXIDE FILM R.	1/2W 47 OHM 5%	R77				1
13		RGHAPJ101B		M-OXIDE FILM R.	1/2W 100 OHM 5%	R132				1
14		RGHAPJ102B		M-OXIDE FILM R.	1/2W 1K OHM 5%	R125				1
15		RGHAPJ221B		M-OXIDE FILM R.	1/2W 220 OHM 5%	R130				1
16		RG2ANJ820B		M-OXIDE FILM R.	2W 82 OHM 5%	R126				1
17		RPGNB50203		SEMI-FIXED VR.	5K OHM B-CURVE	RV1	RV3			2
18		RPGNB50303		SEMI-FIXED VR.	50K OHM B-CURVE	RV2				1
19		TRA8GZ001M		RF COIL		L8				1
20		TRA8GZ002M		RF COIL		T1	T2			2
21		TR07LA004N		I.F.T.		T8				1

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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		TR07LA014S		RF COIL		T10	T9			2
2		TR07MN001M		I.F.T.		T6	T7			2
3		TR10GP003S		RF COIL		T11	T14	T15	T16	4
4		TR10GP004S		RF COIL		T18				1
5		TR10GZ009M		RF COIL		T12	T13	T20		3
6		TR10GZ010M		RF COIL		T17	T19			2
7		TR13GM005S		RF COIL		T3				1
8		TR13GM007S		RF COIL		T4				1
9		TR13GM009S		RF COIL		T5				1
10		VS801XN001		MICA SHEET						2
11		VT220SX001		TERMINAL						7
12		WDD813Z001		COAXIAL CABLE		NO24				1
13		WDD824Z001		COAXIAL CABLE		NO25				1
14		WTGB28EEXX		SOLID WIRE		NO26				1
15		WTGC17EEXX		SOLID WIRE		NO15				1
16		WTGP16EEXX		SOLID WIRE		NO18				1
17		WTGR15EEXX		SOLID WIRE		NO20				1
18		WTGO21EEXX		SOLID WIRE		NO2				1
19		WTG120EEXX		SOLID WIRE		NO1				1
20		WTG208EEXX		SOLID WIRE		NO6				1
21		WTG220EEXX		SOLID WIRE		NO3				1

	PART NAME	PART CODE	
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ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		WTG309EFXX		SOLID WIRE.		NO7				1
2		WTG323EFXX		SOLID WIRE		NO4				1
3		WTG412EFXX		SOLID WIRE		NO10	NO21			2
4		WTG421EFXX		SOLID WIRE		NO5				1
5		WTG524FEXX		SOLID WIRE		NO8				1
6		WTG613EFXX		SOLID WIRE		NO19	NO22			2
7		WTG620EFXX		SOLID WIRE		NO11				1
8		WTG721EEXX		SOLID WIRE		NO12				1
9		WTG816EFXX		SOLID WIRE		NO13	NO14			2
10		WTG912EFXX		SOLID WIRE		NO16				1
11		WTG924EFXX		SOLID WIRE		NO17				1
12		XAS1B3005X		XTAL OSCILLATOR	HC-43/U 12.800MHZ	X2				1
13		XAS1B3006X		XTAL OSCILLATOR		X3				1
14		XAS1B3007X		XTAL OSCILLATOR		X4				1
15		XAS1B3008X		XTAL OSCILLATOR		X5				1
16		XAZ1A5002X		XTAL OSCILLATOR	HC-18/U 11.245MHZ	X1				1
17		YFL0000003		FERRITE BEAD						1
18		YFL0000004		FERRITE BEAD						3
19		YJF10S004Z		JUNCTION JACK.		J1				1
20		ZZZ0000092		F-BRAID WIRE						1
21										

	PART NAME	PART CODE	
	P.W.BOARD ASSY	APTMX011AA	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		ACCN445GEA		CONN CORD ASSY.		AC501				1
2		BTPP2606BN		PAN TAP SCREW	(+)BIT, M2.6 X 6 S-NI					21
3		MU611SN001		CONTACT PLATE						18
4		MW401CX001		SHORT JUMPER	JW-10	J503				1
5		MW401CX003		SHORT JUMPER		J501	J502			2
6		PTMX011E0X		PRINTED W.BOARD						1
7		QDSN4448XZ		SILICON DIODE	1N4448 VRM=100V NO-RANK	D501	D502	D503	D504	76
8						D505	D506	D507	D508	
9						D509	D510	D511	D512	
10						D513	D514	D515	D516	
11						D517	D518	D519	D520	
12						D521	D522	D523	D524	
13						D525	D526	D527	D528	
14						D529	D530	D531	D532	
15						D533	D534	D535	D536	
16						D537	D538	D539	D540	
17						D541	D542	D543	D544	
18						D545	D546	D547	D548	
19						D549	D550	D551	D552	
20						D553	D554	D555	D556	
21						D557	D558	D559	D560	

	PART NAME	PART CODE	STOCK NO.
	P.W.BOARD ASSY	APTMX0111AA	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1						D561	D562	D563	D564	
2						D565	D566	D567	D568	
3						D569	D570	D571	D572	
4						D573	D574	D575	D578	
5		YJF10SC36Z		JUNCTION JACK		Y501				1
6		YPF01S002Z		TERMINAL		Y502				1
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										

	PART NAME	PART CODE	
	P.W.BOARD ASSY	APTSW125AA	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC				Q'TY USED
1		ACCN436GEA		CONN. CORD ASSY		AC601				1
2		ACCN444GEA		CONN CORD ASSY		AC602				1
3		CKDB102PEM		CERAMIC CAP.	1000PF 50V -0, +100% E	C601	C602			2
4		MW401CX001		SHORT JUMPER	JW-10	J2	J6			2
5		MW401CX002		SHORT JUMPER		J7				1
6		MW401CX003		SHORT JUMPER		J3	J5			2
7		MW401CX004		SHORT JUMPER	JW-5	J1				1
8		MW401CX005		SHORT JAMPER	JW-15	J4				1
9		PTSW125C0X		PRINTED W.BOARD						1
10		QDSN4448XZ		SILICON DICDE	1N4448 VRM=100V NO-RANK	D601	D602	D603	D604	10
11						D605	D606	D607	D608	
12						D609	D610			
13		QTC0945AEA		TRANSISTOR	2SC945A P,Q-RANK	Q601	Q602			2
14		RD25TJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R602	R604			2
15		RD25TJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R601	R603			2
16		SR2124302H		ROTARY SWITCH		S601				1
17		WTG009EEXX		SOLID WIRE						1
18		WTG207EEXX		SOLID WIRE						1
19		YJF10S004Z		JUNCTION JACK.		Y601				1
20										
21										

Miscellaneous Parts

PART CODE	NOMENCRATURE	SPECIFICATION
AMTX240001	ESCUTCHEON	
ML681SZ024	SIDE BRACKET, RIGHT	
ML681SZ025	SIDE BRACKET, LEFT	
MS767AM001	REAR PANEL	
VB876SX001	CABINET COVER	
VN110SP006	KNOB, PUSHBUTTON	
VN276SP034	KNOB, VOLUME, SQUELCH	
VN286SP031	KNOB, CHANNEL SELECTOR	
VS765RF001	REAR PANEL GASKET	
VW902RB003	WATER SEAL, FRONT PANEL	
KCC000023AX	FCC FORM 753	
KL000177XX	CHANNEL NUMBER DECAL	
KTTX2400XX	INSTRUCTION MANUAL	
KZ000042XX	FCC FORM 506	
KKTX240001	CARTON	
ACDC085GEA	DC POWER CABLE	INLINE FUSED
MF284SN004	THUMB SCREW	UNIT MOUNTING
MU676SM002	MOUNTING BRACKET	
ZGAAZ501G0	MICROPHONE	
ZQA0570803	SPEAKER (BUILT-IN)	8 OHM/1 W